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THE GENUS ACINOPTERUS (HOMOPTERA).....*P. B. Lawson.*

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The Genus *Acinopterus* (Homoptera, Cicadellidæ).

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INTRODUCTION.

THE genus *Acinopterus* was erected by Van Duzee in 1892 to accommodate the species *Acinopterus acuminatus*. Later, in 1895, Baker described a single specimen as *Phlepsius inornatus*, a species which Van Duzee in his catalogue lists as *Acinopterus acuminatus* var. *inornatus*. Finally, in 1903, Ball described three varieties of the typical species of the genus, the first of which, variety *variegatus*, Van Duzee made a synonym of Baker's variety *inornatus*. Thus up to the time that the writer undertook this study, one species and three varieties were recognized as comprising the membership of this genus. The results of the study show that we now have at least eight species and one variety. One or two other species are probably represented in the material at hand, but because of the scarcity of specimens it was not thought best to describe them as new species.

The writer is indebted to the following workers for very kindly loaning him the material studied: Mr. E. L. Dickerson, Mr. George G. Ainslie, Mr. F. H. Lathrop, Prof. J. G. Sanders, Dr. Dwight M. De Long, Mr. C. E. Olson, Mr. Edmund H. Gibson, Prof. H. O. Osborn, and Dr. E. D. Ball. The work done is based for the most part on the many specimens from the collection of Doctor Ball, who not only loaned him all his own material, but also the types in the collection of the Iowa State Agricultural College, and in addition was a great help in making suggestions and giving information as to distribution and host plants. To Mr. E. H. Gibson and Mr. W. L. McAtee the writer owes the privilege of examining the collection

of the National Museum, including the type of Baker's *inornatus*. Through the kindness of Dr. J. Chester Bradley, the material at Cornell University was studied, and Prof. C. P. Gillette kindly permitted the examination of the collection of the Colorado Agricultural College.

DISTRIBUTION.

As far as our present knowledge goes, the members of this genus have hitherto been taken only in the United States and Mexico, a single specimen at least having been collected as far south as Yucatan. In our country it is for the most part southern and western in its distribution. This, along with its occurrence in Mexico, would indicate its probable presence throughout Central America and perhaps in the northern portion of South America. For this last statement, however, there is no certain data. The genus is, therefore, both Nearctic and Neotropical.

The following states have yielded specimens of this genus: New Jersey, Maryland, District of Columbia, North Carolina, South Carolina, Virginia, West Virginia, Florida, Alabama, Mississippi, Tennessee, Arkansas, Missouri, Kansas, Oklahoma, Colorado, Utah, Washington, California, Arizona, Texas and Georgia.

HOST PLANTS.

Very little information is available as to the specific plants on which the members of this genus feed. Most of the specimens collected were taken while sweeping grasses or weeds. De Long reports *Acinopterus acuminatus* as abundant on grasses in Tennessee. Ainslie took specimens from blue grass. Doctor Ball believes that *A viridis* var. *variegatus* feeds on wild geranium. A single specimen of *A. angulatus* was swept from *Sphæralcea angustifolia*. A label on a specimen of *A. acuminatus* from Oklahoma states that it was taken from *Amphiachyris*, while another specimen from Rosser, Tex., was taken from *Tetraneuris*. Evidently most of the members of the genus are either grass feeders or else have as their hosts various weeds found in grassland. Much more careful collecting will need to be done before we can be certain of the specific hosts.

DESCRIPTION OF THE GENUS.

The following is Van Duzee's description of the genus:

General appearance of *Allygus*, but with the elytra strongly narrowed posteriorly, and the tip acute.

Head narrower than the pronotum, rounded, or somewhat produced before,

with the apex subacute, hind edge broadly concave. Vertex rather short, sloping, convex or more or less impressed behind the apex, surface punctured, the anterior submargin obscurely transversely rugose, passage to the front rounded. Front rather broad, at the base slightly encroaching upon the apex of the vertex, suddenly narrowed at tip. Clypeus much widened apically. Loræ large. Cheeks wide. Pronotum broad and rather short, anterior edge broadly arcuate, posterior nearly straight; sides long, oblique, carinated; lateral angles prominent, latero-posterior rounded. Scutellum rather small. Elytra narrow, lanceolate at apex, the tip acute, appendix wanting; sutural edge straight to the extreme tip; costal and apical margins continuous; apical areoles five, inner small, oblique, second largest, reaching the extreme tip; third and fourth small; fifth, or stigmatal, long and usually crossed by one or two transverse veinlets; first and second sectors united by but one transverse nervure, but there are usually three or four connecting the outer claval nervure with the claval suture; all the nervures strong; costa feebly convex. Supernumerary cell of the wings present. Otherwise as in *Athysanus* and *Allygus*.

The above description needs modification to enable it to include the several species in which the tegmina, while visibly narrowed apically, do not end in an acute tip, the sutural margin in these cases not continuing on straight to the extreme apex, but meeting the costal margin to form a rather broadly rounded tip. The writer, therefore, proposes the following generic description:

Head usually narrower than pronotum, rarely as wide. Vertex rounded or distinctly angulate, usually impressed behind the apex, sloping, broadly rounding with the front. Front broad basally, much narrowed apically. Clypeus widened apically. Loræ large, nearly reaching margin of the wide genæ ventrally. Pronotum wide, over twice as wide as long, anterior and posterior margins nearly parallel, latter usually more nearly straight; lateral and humeral margins distinct; disc transversely wrinkled. Scutellum finely granular and with distinct transverse impressed line. Tegmina moderately long, apex always narrowed, sometimes to an acute tip. Venation distinct. Of the five apical cells M_4 is the largest, but it, along with Cu_1 and R_2, is frequently divided by cross-veins, R_2 being so regularly divided that probably both R_1 and R_2 are present. Cell 2d M is not divided by a cross-vein. Veins 1st A and 2d A almost always connected by one or more cross-veins. Valve of male always hidden under last ventral segment; plates usually long but never equaling pygofers. Female, last ventral segment large, always bearing a median notch.

SYSTEMATIC TREATMENT OF THE SPECIES.

KEY TO SPECIES.

A. Apex of tegmina strongly acute; costal margin straight clear to tip.
  B. Brownish or greyish species.
    C. Darker and larger species.
      D. Male plates long and narrow, parallel-margined, apices rounded; last ventral segment of female without lateral angles. *acuminatus* Van D.
      DD. Male plates broad and shorter, apices distinctly divergent; last ventral segment of female with distinct lateral angles. *angulatus* n. sp.
    CC. Lighter and more slender species. *inornatus* (Bak.).
  BB. Greenish species. *productus* n. sp.
AA. Apex of tegmina rounded; costal margin not running straight clear to tip.
  B. Species brownish or greyish, not distinctly green.
    C. Species large; last ventral segment of female strongly produced medially. *brunneus* Ball.
    CC. Species smaller; last ventral segment of female normally produced.
      D. Species with elytra distinctly variegated. *viridis* var. *variegatus* Ball.
      DD. Species with elytra not variegated *pallidus* n. sp.
  BB. Greenish species.
    C. Species larger; plates of male tapering and distinctly divergent apically. *viridis* Ball.
    CC. Species smaller; plates of male parallel-margined and but slightly divergent apically. *obtutus* n. sp.

Acinopterus acuminatus Van D.

(Pl. VIII, fig. 1; pl. IX, fig. 1; pl. X, fig. 1; pl. XI, fig. 1; pl. XII, figs. 1, 2.)

Acinopterus acuminatus Van D., Psyche, vi, p. 308, 1892.
Acinopterus acuminatus G. & B., Hemip. Colo., p. 94, 1895.
Acinopterus acuminatus Van D., Bul. Buf. Soc. Nat. Sci., viii, No. 5, p. 69, 1907; ix, p. 225, 1909.
Acinopterus acuminatus Osb., Ohio Nat., ix, p. 466, 1909.
Acinopterus acuminatus Smith, Cat. Ins. N. J., edn. 3, p. 105, 1910.
Acinopterus acuminatus Barb., Bul. Am. Mus. Nat. Hist., xxxiii, p. 534, 1914.
Acinopterus acuminatus Van D., Trans. San Diego Soc. Nat. Hist., ii, p. 54, 1914.
Acinopterus acuminatus Metc., Jl. Elisha Mitchell Sci. Soc., xxxi, p. 23, 1915.
Acinopterus acuminatus De L., Tenn. St. Bd. Ent., Bul. 17, p. 89, 1916.
Acinopterus acuminatus Van D., Cat. Hemip. N. A., p. 675, 1917.
Acinopterus acuminatus Lathr., S. C. Agr. Exp. Sta., Bul. 199, p. 102, 1919.
Acinopterus acuminatus Laws., Kans. Univ. Sci. Bul., xii, p. 207, 1920.

The following is the original description of this species:

Fulvous brown tinged with dull green or yellowish, elytral nervures pale, brown-margined. Length, 5-6½ mm.

Head pale. Front with about eight brown arcs, more or less distinct. Pronotum feebly calloused on the anterior margin, with a few shallow impressions arranged parallel to the edge, more obvious in the males; lateral margin as long as the latero-posterior, acutely carinated; disc posteriorly obscurely wrinkled. Basal angles of the scutellum with a brownish triangular spot more or less apparent. Pectoral pieces usually more or less invaded with blackish, sometimes pale and immaculate. Legs pale, or suffused with

sanguineous. Abdomen pale, frequently black above, excepting the broad lateral margins; infuscated on the basal and apical segments of the venter in the females; slightly suffused with a pale median line in the males. Elytra pale fulvous, frequently whitish hyaline on the disc of the costal and some of the discal areoles of the corium, and on the inner margin of the clavus, the extreme apex clouded with smoky or even blackish; nervures pale, edged with brownish, the marginal with a fuscous interruption at tip; claval suture brown. Wings smoky, iridescent, nervures fuscous.

Genitalia. Male: Valve wanting. Plates long and narrow, a little longer than the last ventral segment, about one-third wider at base than at their obtusely lanceolate, divergent tips. Pygofers twice the length of the plates, narrowed and obtusely pointed at apex, armed beyond the plates with numerous stout spines. Female: Last ventral segment rather long, hind edge with a shallow median notch, either side of which is a broadly rounded lobe, retreating at the outer angles. Pygofers rather broad, their subacute apex moderately exceeded by the oviduct.

Described from 5 males, 3 females. Maryland, September 29 and August 4, on pines (Uhler); North Carolina (Osborn); New Jersey (Uhler); mountains of northwest Colorado (Gillette); California (Coquillett).

In a male from California the lower surface of the femora is black. A female from North Carolina has the disc of the elytra white-pruinose, and all the specimens exhibit considerable variation in the extent of the black markings.

The writer gives the following description:

A large, rather robust, brownish species, ranging from a greyish-brown to a usually dark-brown color. Length, 5 to 7 mm.

Form. Head distinctly narrower than the pronotum. Vertex usually distinctly produced medially, about half longer at the middle than next the eyes and about twice as broad as long. Front broad, loræ large, cheeks wide, clypeus widened apically. Pronotum over twice as wide as long, anterior margin usually a little more curved than posterior, the lateral and humeral margins subequal, the disc transversely wrinkled. Scutellum large, the surface granular. Tegmina moderately long, the costal margin running straight clear to the apex, forming an acute tip.

Color. Vertex, pronotum and scutellum brownish to olive green, the scutellum with basal angles and three longitudinal lines, light. Tegmina usually shining dark brown, sometimes lighter. When dark brown the nervures are lighter and some of the cells, especially along the costa and on the clavus, are subhyaline or greenish. Light specimens have the viens, especially apically, bordered with brown. Face olive green, unmarked, or with faint arcs on the front. Below olive green, marked more or less with dark brown or black, especially on the thorax, coxæ and tergites of the abdomen.

External genitalia. Female: Last ventral segment twice as long as preceding, broad basally, lateral margins rounding to slightly notched and produced posterior margin; pygofers bearing a few scattered spines and slightly exceeded by ovipositor. Male: Valve not visible, plates long and narrow, parallel-margined, obtuse apices somewhat divergent and greatly exceeded by spiny pygofers.

Internal male genitalia. Styles with margins of anterior half sinuately tapering, distal half stout and strongly curved; the large, club-shaped and coarsely granular apices strongly diverging. Connective small, heart-shaped, with the excision wide and the apex broadly rounding. Œdagus broad basally, narrowing to the middle, bearing two small basal processes and a larger apical one near the tip of which, on the ventral surface, is the fimbriated opening of the penis.

Distribution. This species is largely southern and eastern in its distribution. The many specimens examined by the writer, in addition to those mentioned by Van Duzee, are distributed as follows: Charter Oak, Pa. (J. N. Knull); Pt. Royal, Harrisburg, Rockville, Pa. (J. G. Sanders); Lakehurst, N. J. (J. B. Weiss); Great Falls, Md., Berkeley, W. Va., Ft. Royal, Va., Washington, D. C. (Heidemann); Orangeburg, S. C. (F. H. Lathrop); Kansas City, Mo. (F. Rogers); Bisc Bay, Jacksonville, Fla., Gainesville, Fla. (C. J. Drake); Ardmore, Okla. (F. C. Bishopp); Jacksonville, Tex. (W. D. Pierce); Boerne, Tex. (F. C. Pratt); Victoria, Rosser, Tex. (J. D. Mitchell); Kushla, Ala. (A. H. Sturtevant); Alabama, Florida, Mexico (C. F. Baker); Knoxville, Nashville, Tenn. (W. B. Cartwright, C. C. Hill); Nashville, Covey Spring, Chattanooga, Tenn. (Geo. G. Ainslie); Colliersville, Clarksville, Paris, Lexington, Tenn. (Dwight M. De Long); Agricultural College, Mississippi (H. E. Weed); Cherokee, Bourbon and Miami counties, Kansas (R. H. Beamer); Virginia, labeled *Jassus tructilis,* (Uhler); Spring Creek, Okefinokee Swamp, Bainbridge, Ga. (J. C. Bradley); Little Rock, Ark.; Capa, S. D.

E. L. Dickerson reports what are presumably this species from Cologne, Lakehurst and Egg Harbor, N. J.

Remarks. The writer has examined the three type specimens, one male and two females, of *Acinopterus acuminatus* from the collection of the Iowa State College, and the female type from the Cornell University collection. The two female specimens from Maryland and Virginia are clearly of a different species from the male and female from California, as shown by a comparison of the last ventral segment of the two females. It seems evident, though, that the majority of the eight specimens from which Van Duzee described the species were from the East or Southeast, and that he evidently meant to describe a species with such a distribution. Accordingly these eastern females are retained as types of this species, while the two California specimens, along with a large amount of western material, are placed in the following species, which not only is clearly western in its distribution, but is decidedly different as to the genitalia of both males and females from the above species.

Acinopterus angulatus n. sp.

(Pl. VIII, fig. 8; pl. IX, fig. 3; pl. X, fig. 2; pl. XI, fig. 4; pl. XII, figs. 5, 6.)

A smaller species than the preceding, varying from light to dark brown in color, but uniformly lighter than *acuminatus* and lacking its olive-green tinge. Length, 5 to 6.25 mm.

Form. Head broad, scarcely narrower than prothorax. Vertex broad and short, over twice as wide as long, about one-third longer at middle than next the eyes, anterior margin rounded or slightly angulate, sloping, and with an impressed line behind the apex. Front broad and short, loræ, clypeus and genæ characteristic of the genus. Pronotum over twice as wide as long, anterior margin broadly convex, posterior margin shallowly concave, lateral and humeral margins distinct, the disc transversely wrinkled. Scutellum finely granulated, the transverse impressed line curved and distinct. Tegmina with sutural margin running straight clear to the tip, forming an acute apex. Venation distinct, with from one to several cross-veins between the first and second anal veins.

Color. Vertex, pronotum and scutellum brown or yellowish brown. Scutellum with basal angles and three longitudinal lines, light. Elytra brown, the veins margined with darker brown, so that many of the cells, especially along the costa and apically, appear light. Face brown; front with eight pairs of dark-brown lines, which are longest above and shortest below, leaving the middle portion unmarked. Below brown, but with parts of thorax, the coxæ and femora of the meso- and metathoracic legs and the dorsum of the abdomen usually black or dark brown.

External genitalia. Female: Last ventral segment twice as long as preceding, the posterior margin varying from slightly concave to slightly convex, but always with a slight median notch and forming very distinct lateral angles with the long lateral margins. Pygofers moderately wide, sparsely spined, exceeded slightly by the ovipositor. Male: Last ventral segment long, hiding the valve. Plates broad, about the length of the last ventral segment, only slightly narrowing to the obtuse tips which are divergent medially, but have distinct lateral angles. Pygofers with a few stout spines and exceeding the plates by about two-thirds the length of the latter.

Internal male genitalia. Styles with rather small and pointed anterior ends, widest at point of the distinct process to the connective, then strongly curved to the very wide apices, which are quite granulated and clearly concave between the outer angle and the larger, more produced inner apex. The outer margin bears a few small spines. Connective heart-shaped, the apex quite broad. Œdagus of the pattern characteristic of the genus, the basal processes well developed and toothed, the terminal process very long, clearly showing the penis, which opens at the fimbriate extreme apex of the process.

Distribution. With one exception, a specimen from Washington, D. C., all the material at hand came from the South and West. A single specimen was taken in Yucatan, many specimens coming from other parts of Mexico. We are evidently safe in calling it a southwestern species, which may possibly extend its range into the southeastern states. The following are the locality records of the

material studied: Riverside, Chino, San Diego, Ontario, Visalia, Tia Juana, Oroville, Caliente (Ball); Hamilton (no collector's name); Los Angeles (Coquillett and A. Koebele); Whittier, Brawley (H. O. Osborn); all from California, along with a number of specimens taken by C. F. Baker; Vera Cruz (no collector's name) along with two specimens taken by Gillette and a series by Baker, all from Mexico; Victoria (J. D. Mitchell), Orizaba (H. Osborn), College Station (no collector's name), Brewster county (Mitchell and Cushman), all from Texas. Also a single specimen taken at Progresso, Yucatan, by Frederick Knab, and one taken at Washington, D. C.

Holotype, male, Ontario, Cal. Collection of E. D. Ball.

Allotype, female, Ontario, Cal. Snow collection, University of Kansas.

Paratypes, male, Visalia, Cal., and female, Chino, Cal., in collection of E. D. Ball; male, Riverside, Cal., and female, Chino, Cal., in Snow collection; male, Whittier, Cal., and female, Brawley, Cal., in collection of H. O. Osborn.

Acinopterus inornatus (Bak.)

(Pl. VIII, figs. 3, 4 [type], 5; pl. IX, figs. 8, 9; pl. X, fig. 6; pl. XI, fig. 7; pl. XII, figs. 11, 12.)

Phlepsius inornatus Bak., Psyche, vii, Suppl. i, p. 13, 1895.
Acinopterus acuminatus var. *inornatus* Van D., Cat. Hemip. N. A., p. 675, 1917.

The following is the original description.

Phlepsius inornatus, n. sp. Differing from all other species of the genus in being entirely destitute of elytral reticulations or other markings. Length of male, 6 mm.

Male: Head narrower than the pronotum. Face a twelfth wider than long; clypeus one-half longer than broad, somewhat constricted before the base, basal suture strongly curved, apex slightly concave; loræ as long and two-thirds as broad as clypeus; margin of genæ rather slightly incurved below the eye, below this strongly convex, thence slightly incurved to tip of clypeus. Front an eleventh longer than broad, somewhat less than twice the length of the clypeus, broad below, the sides very slightly incurved at the antennæ. Disc of the vertex flat, length at middle once and a half that next the eye, width between the eyes once and a half the length. Width of the pronotum two and a third times the length, the length about once and two-thirds that of the vertex, curvature nearly two-fifths of the length, posteriorly irregularly transversely wrinkled. Scutellum and elytral venation normal. Plate not visible, valves two and a half times longer than broad at base, slightly narrowed at apex, blunt at tips, without hairs. Pygofers one-half longer than valves, pointed at tips, their whole outline subtriangular, provided on disc of lower surface with several rather long whitish spines arranged in a single longitudinal row.

Color very pale yellowish, deeper on the abdomen. Pronotum with five very indistinct longitudinal whitish bands. Elytra translucent, pale milky

white, with indistinct smoky clouds on the discs of some of the apical and anteapical areoles. Veins white, claval suture brownish. Face and legs tinged with greenish, some of the white tibial spines brown tipped. Tarsal joints at apices dark. Dorsal abdominal segments, except lateral and apical margins, blackish.

Described from a single male taken at San Augustine (Ckll. 2140). In form this insect very closely resembles *P. superbus* and in structure is strictly congeneric with it. It differs very widely, however (and this is a generic difference according to Van Duzee's synoptic table of the genera), in that it does not possess the elytral reticulations or other markings so characteristic of the genus. On a very superficial examination it might be taken for a Chlorotettix, but its general form, stronger build, and lengthened vertex are strictly Phlepsiid.

The writer gives the following description:

A rather slender and light-colored species which sometimes may be rather dark. Length, 5 to 6.5 mm.

Form. Head distinctly narrower than the pronotum. Vertex varying in length, but usually about twice as wide as long and half longer at the middle than next the eye; disc sloping and with the impressed line behind the apex. Face as in the other members of the genus. Pronotum over twice as wide as long, the anterior margin more strongly curved than the posterior, the lateral and humeral margins about equal. Scutellum of average size, finely granulated, and with distinct transverse impressed line. Tegmina long and narrow, sutural margin extending straight clear to tip, forming an acute apex; venation usually distinct, though sometimes rather weak, with from one to several cross-veins between the first and second anal veins.

Color. Yellowish or yellowish grey. Pronotum with five pale and sometimes indistinct lines. The tegmina vary considerably, being sometimes almost colorless till near the tip, while in others the veins are margined lightly with brown, especially at the margins, but in all cases some of the apical cells are more or less darkened. The darkened tips of the veins along the sutural and costal margins sometimes give the elytra a variegated appearance. Beneath this species is usually light except for the darkened dorsum of the abdomen.

External genitalia. Female: Last ventral segment over twice as long as the preceding, posterior margin distinctly but roundingly produced medially, but with the small median notch characteristic of the genus. Pygofers moderately wide, sparsely spined, and slightly exceeded by the ovipositor. Male: Last ventral segment longer than the preceding, hiding the valve. Plates long and fingerlike, about the length of the last ventral segment, slightly narrowed to the somewhat diverging but rounded tips. Pygofers bearing a few stout spines and exceeding the plates by about two-thirds the length of the latter.

Internal male genitalia. Styles wide basally and with strong process to connective; apically strongly curved and clublike, the apical portion of the club with distinct and large granulations, giving it a rough appearance. Connective heart-shaped, the excision wide and shallow, the apex rounded. Œdagus rather small but stout, the upper part much like an inverted boot, the heel distinctly cleft; the paired basal processes about half the length of the apical process, their lower edges serrate; the terminal process stout, the penis opening at the fimbriate tip.

Distribution. This species is evidently a southwestern form, for all the material at hand was taken in this region. The following are the locality records of the twenty-two specimens examined: Type specimens from San Augustine, N. M. (C. F. Baker); Ontario, Riverside, Cal. (E. D. Ball); Santa Rita mountains (F. H. Snow), Galiuro mountains (H. G. Hubbard), Phoenix (E. D. Ball), Sabino Canyon, St. Catalina mountains (E. L. Dickerson), all from Arizona; Brewster county, Texas (Mitchell and Cushman).

Remarks. As far as the writer knows, this species has been known hitherto only from the type. In thé material gathered for the study of the genus he found a number of similar specimens, which, while differing in some ways, particularly in the length of the vertex and the extent of the elytral markings, are yet thought to be representatives of this species, for a careful study of the genitalia of several males revealed no differences, although the vertices of the specimens were quite unlike. Also the specimens show a complete range in color from that of the very light type specimen to forms that are distinctly brownish. While frankly having some doubt as to the specific identity of all the material named thus, the writer feels it better to call them all the same species rather than to describe new species on insufficient material.

Acinopterus productus n. sp.

(Pl. VIII, fig. 6; pl. IX, fig. 2; pl. X, fig. 3; pl. XI, fig. 3; pl. XII, figs. 13, 14.)

A distinctly greenish species, differing from other green forms by the acute apex of the tegmina and the produced vertex.

Form. Head distinctly narrower than pronotum. Vertex less than twice as wide as long, at least half longer at the middle than next the eye, the apex rounded and with an impressed line parallel with the margin. Face characteristic of the genus. Pronotum short, well over twice as wide as long, the anterior margin more strongly curved than the posterior, the lateral and humeral margins about equal, the disc transversely wrinkled. Scutellum with the usual granular surface and impressed line. Tegmina long and rather narrow, the costal margin running straight clear to the tip, forming an acute apex, and with the nervures distinct, the first and second anal veins usually united by several cross-veins.

Color. The entire insect is green except for the darkened apices of the elytra and the yellowish or pinkish legs. The nervures stand out as a lighter green than the cells of the tegmina.

External genitalia. Female: Last ventral segment over twice as long as the preceding, the medially produced posterior margin with the usual small notch, the lateral margins rounding with the posterior. Pygofers rather robust, sparsely spined, and slightly exceeded by the ovipositor. Male: Valve hidden by the long last ventral segment. Plates longer than last ventral segment, fairly wide basally, tapering to the divergent and rounded but com-

paratively narrow apex. Sparsely bristled pygofers exceeding plates by about two-thirds the length of the latter.

Internal male genitalia. Styles of usual form, widest at point of process to connective, apically club-shaped, the granulated and blunt apices slightly but clearly concave. Connective heart-shaped, the excision fairly deep. Œdagus with body as in other species, the basal processes small, the terminal process of medium diameter and length.

Distribution. The eight specimens at hand when this species was described all came from California and Arizona. They were all taken by Dr. E. D. Ball. The California specimens are from Imperial, Beaumont and Riverside, while the two Arizona specimens are from Phoenix.

Holotype, female, Imperial, Cal., in collection of Doctor Ball.

Allotype, male, and paratype, female, both from Imperial, Cal., in the Snow collection, University of Kansas.

Paratypes, male from Imperial and female from Beaumont, Cal., in collection of Doctor Ball.

Acinopterus brunneus Ball.

(Pl. VIII, fig. 2; pl. IX, fig. 5; pl. X, fig. 7; pl. XI, fig. 6; pl. XII, figs. 9, 10.)

Acinopterus acuminatus var. *brunneus* Ball, Can. Ent., xxxv, p. 231, 1903.
Acinopterus acuminatus var. *brunneus* Van D., Cat. Hemip. N. A., p. 675, 1917.

The following is the original description:

A. acuminatus, var. *brunneus*, n. var. Slightly larger than the preceding variety. Vertex, pronotum and scutellum pale green, washed with cinnamon brown. Elytra pale cinnamon brown, slightly fuscous at tip. Whole insect with a slight tawny iridescence, below pale green.

Described from three specimens from Rifle, Colo., taken by the author.

The writer adds the following description:

A large brownish or greenish-brown species, about the largest member of the genus. Length, 5.5 to 6.75 mm.

Form. Head about as wide as the pronotum. Vertex at least twice as wide as long, one-third longer at middle than next the eye, the anterior margin rounded, and with the characteristic depression behind the apex. Face with all the parts very broad, the loræ nearly reaching the margin of the genæ. Pronotum over twice as wide as long, the anterior margin more strongly curved than the posterior, lateral and humeral margins distinct and about equal, the disc transversely wrinkled. Scutellum as in other members of the genus. Tegmina with rounded apex but more acute than in *viridis*, the venation often less distinct than in other species, and usually with several cross-veins between the first and second anal veins.

Color. Vertex, pronotum and scutellum greenish-brown. Tegmina of same color or darker, the veins of the apical half often being margined with dark brown, giving the tip a darker appearance. Beneath the color is usually as above but sometimes the hind legs and abdomen have a reddish tinge.

External genitalia. Female: Last ventral segment differing from that of any other member of the genus in being extremely produced medially, three times as long as the preceding segment, with the usual small apical excision, and the lateral margins sometimes slightly concave. The broad and spiny pygofers are slightly exceeded by the ovipositor. Male: Last ventral segment long, hiding the valve. Plates long and slender, longer than last ventral segment, their sides straight to the somewhat narrowed but rounded apices. Pygofers long, exceeding plates by about the length of the latter, bearing the usual spines.

Internal male genitalia. Styles stout, apical part nearly of same width throughout and bearing many granulations. Connective as broad apically as basally. Œdagus unlike anything in the genus and very characteristic, the basal processes short and not serrate, the distal process very long, the fimbriate opening of the penis extending back from the extreme tip for a considerable distance. In addition a pair of large ventral and lateral lobes is present that completely cover the basal processes, these lobes being serrate along their ventral margin. The entire dorsal part of the œdagus is also quite different from the corresponding part in the other species of the genus.

Distribution. With the exception of a single specimen taken by Coquillett at Los Angeles, Cal., all the other fourteen specimens examined by the writer are from Doctor Ball's collection. These were taken from the following localities: Rifle, Colo.; Pardman, Salt Lake City, Utah; Ravenna, Cabazon, Riverside, and Beaumont, Cal.

Acinopterus pallidus n. sp.

(Pl. VIII, fig. 10; pl. IX, fig. 4; pl. XI, fig. 2.)

Closely related to the preceding species, but slightly smaller and paler. Length, 5.5 to 6 mm.

Form. Head distinctly narrower than the pronotum. Vertex a little over twice as wide as long, not quite one-third longer at the middle than next the eye, the anterior margin evenly rounded and broadly rounding with the front, the depression back of the apex small. Face very broad, the front fully as broad basally as long, and the genæ quite wide. Pronotum over twice as wide as long, anterior margin but slightly more curved than the posterior, lateral and humeral margins about equal, disc with transverse wrinkles. Scutellum with usual granular surface and transverse impressed line. Tegmina moderately long, the apices more rounded than in preceding species, venation distinct but not conspicuous, and with but one or two cross-veins between the first and second anal veins.

Color. The entire insect, above and below, of a pale greenish-yellow color. Apices of some of the veins along costal margin and at apex margined with black, making the tips of the tegmina appear slightly darkened. The tarsi tend to be brownish.

External genitalia. Female: Last ventral segment produced medially, bearing a shallow median notch apically from which the margins round to the base. Pygofers large, sparsely spined, exceeded by the ovipositor.

Distribution. Described from four specimens taken by Doctor Ball at Cabazon, Cal.

Holotype, female, and two paratypes, females, in collection of Doctor Ball.

One paratype, female, in the Snow collection, University of Kansas.

Remarks. This species stands between *brunneus* and *viridis*. From the former it differs in its smaller size, lighter color, and shorter female ventral segment, while from the latter it differs in being lighter, and in not having the tegminal veins green.

Acinopterus viridis Ball.

(Pl. VIII, fig. 11; pl. IX, fig. 6; pl. X, fig. 4; pl. XI, fig. 5; pl. XII, figs. 7, 8.)

Acinopterus acuminatus var. *viridis* Ball, Can. Ent., xxxv, p. 231, 1903.
Acinopterus acuminatus var. *viridis* Van D., Cat. Hemip. N. A., p. 675, 1917.
Acinopterus acuminatus var. *viridis* Laws., Kan. Univ. Sci. Bul., xii, p. 208, 1920.

The following is the original description:

A. acuminatus, var. *viridis,* n. var. Form and structure of the preceding nearly; slightly smaller. Bright grass green both above and below. Eyes and extreme tip of elytra fuscous.

Described from a number of specimens from southern Colorado and Arizona. This is the common form in southern Colorado, where it was taken by E. P. Van Duzee and the author.

The following description is by the writer:

A rather robust greenish species, with or without elytral markings. Length, 5 to 6 mm.

Form. Head distinctly narrower than the pronotum. Vertex about twice as wide as long, one-half longer at the middle than next the eye, anterior margin broadly rounded and with a depression just behind apex. Face with all the sclerites broad. Pronotum over twice as wide as long, anterior margin more strongly curved than the posterior, lateral and humeral margins about equal, the disc transversely wrinkled. Scutellum as in other members of the genus. Tegmina moderately long, the apex narrowed but rounded, with usually one or two or sometimes several cross-veins between the first and second anal veins and sometimes one or two between the second and third.

Color. Vertex, pronotum and scutellum usually green, though sometimes distinctly yellowish. Tegmina green with the nervures darker green, the latter being sometimes not margined at all or bordered with brown till all the apices of the veins at the sutural margin, along the distal half of the costal margin, and at the apex, are definitely bordered, frequently giving the apex a darker appearance. Below the insect is also green, the tarsi tending to be brownish.

External genitalia. Female: Last ventral segment over twice as long as the preceding, the lateral and posterior margins rounding to the produced apex which bears the usual small median notch. Pygofers stout, sparsely spined, exceeded by the ovipositor. Male: Last ventral segment long, hiding the valve. Plates long and slender, slightly longer than last ventral segment, the bases distinctly wider than the divergent apices. Pygofers broad, sparsely spined, exceeding the plates by about two-thirds the length of the latter.

Internal male genitalia. Styles large, widest at point of process to connec-

tive, distal portion strongly curved and then running straight to the expanded tips, which have the inner angles about right-angled, but the outer angles strongly produced, the distal margin between the two corners being slightly concave. The outer margins of the distal half are roughened and the characteristic granulations appear over the entire apical portion. Connective heart-shaped, the apex broadly rounded. Œdagus very characteristic of the species, having two pairs of basal processes, the upper ones shorter, the lower ones reaching nearly to the tip of the apical process, at the extreme fimbriate tip of which the penis opens. Both pairs of basal processes bear teeth along the margins.

Distribution. All of the twenty-five specimens, except one from Colorado, one from Morton county, Kansas, and one from Ashfork, Ariz. (Barber and Schwarz), were sent the writer by Doctor Ball, who obtained them from the following localities: Soldier, Dixie, Richfield, Monroe, Moab, Utah; Fort Collins, Grand Junction, Delta, Dutch George or Poudre Canyon, Colo.; Coolidge, Kan.; Wenatchee, Wash.; Phoenix, Ariz. There are specimens also in the collection of the Colorado Agricultural College from some of these localities.

Remarks. The specimen from Moab, Utah, seems to be different from the other specimens of this species in that it is lighter in color, has a broader head, and longer and more pointed elytra. There being only one specimen of its kind, however, the writer prefers to place it here to describing it as a new species from a single specimen.

Acinopterus viridis var. *variegatus* Ball.

(Pl. VIII, fig. 7; pl. IX, fig. 7.)

Acinopterus acuminatus var. *variegatus* Ball, Can. Ent., xxxv, p. 231, 1903.
Acinopterus acuminatus var. *inornatus* Van. D., Cat. Hemip. N. A., p. 675, 1917.

The following is the original description:

Acinopterus acuminatus, var. *variegatus,* n. var. Form and structure of the species, but much lighter colored. Vertex, pronotum and scutellum inclined to be reddish, especially in the male. Elytra whitish pruinose, nervures greenish, not margined, except towards apex and along sutural margin, three fuscous points along the suture, and sometimes one on the disc of each elytron.

Described from twenty-four specimens from Colorado and Arizona.

The following is the writer's description:

The members of this variety are like *viridis* except in color.

Color. General color, brown. Vertex, pronotum and scutellum greyish or brownish, sometimes with a reddish tinge. Tegmina pale, but with nervures margined more or less throughout, especially along sutural and costal margins and apically, giving them a decidedly variegated appearance.

Distribution. Eight specimens examined are from Doctor Ball's collection and were taken by him at Fort Collins and Denver, Colo.

In the collection of the Colorado Agricultural College are other specimens from the same localities.

Remarks. The specimens at hand show gradual gradations into the variegated form of *viridis*, which, in its turn, goes by insensible gradations into the pure green form characteristic of the species. An examination of the male internal genitalia of typical *variegatus* and that of a variegated *viridis* showed no differences, and the gradual loss of the tegminal markings into the plain green form would seem to indicate the identity of these two green forms.

Acinopterus obtutus n. sp.

(Pl. VIII, fig. 9; pl. X, fig. 5; pl. XII, figs. 3, 4.)

A rather small green species with a relatively larger vertex than *viridis*. Length, 5.5 mm.

Form. Head distinctly narrower than pronotum. Vertex large, about twice as wide as long, one-half longer at the middle than next the eye, a slight depression just behind the broadly rounded apex which rounds very obtusely with the front. All the sclerites of the face rather broad. Pronotum over twice as wide as long, the anterior margin more curved than the posterior, the lateral and humeral margins about equal, the transverse wrinkles of the disc indistinct. Scutellum with the usual granulated surface and transverse impressed line. Tegmina with the tips broken off in all three of the specimens from which the species is described, but presumably rather rounded apically, judging from the material studied. Claval area with a few cross-veins between the first and second anal veins.

Color. Vertex, pronotum and scutellum green, the scutellum with basal angles and three longitudinal lines, light. Tegmina milky green, the veins light or dark green, and margined more or less with brown. Below the entire insect is green.

External genitalia. Male: Last ventral segment long, hiding the valve. Plates long and narrow, nearly parallel-margined to the somewhat divergent apices, which are exceeded by the bristly pygofers by about two-thirds the length of the former.

Internal male genitalia. Styles of the usual shape, the granular apical portions quite expanded at the tip, which is either straight or slightly concave at the end. Connective nearly round, the basal excision rather deep. Œdagus differing from that of any member of the genus. The body is very wide basally, the heel cleft, then strongly narrowed to the base of the processes, of which the basal pair are short and slender while the distal one is quite long and slender, the penis opening at the extreme fimbriate tip.

Distribution. The three male specimens from which this species is described are all from the collection of Mr. E. L. Dickerson and were taken in the Sabino canyon of the St. Catalina mountains of Arizona.

Remarks. This species is decidedly smaller than the other green species, and the œdagus is so characteristic that on this structure

alone the writer is confidently basing the distinctness of these species. Among the specimens of *viridis* from Colorado and Utah there may be one or two that are the females of this species, but not being as sure of their position as of these three males, they are left in the former group.

Holotype in collection of Mr. E. L. Dickerson.

Paratypes in collection of Doctor Ball and the Snow Collection, University of Kansas.

PLATE VIII.

FIG. 1. *A. acuminatus.*
FIG. 2. *A. brunneus.*
FIGS. 3, 4, 5. *A. inornatus.*
FIG. 6. *A. productus.*
FIG. 7. *A. viridis* var. *variegatus.*
FIG. 8. *A. angulatus.*
FIG. 9. *A. obtutus.*
FIG. 10. *A. pallidus.*
FIG. 11. *A. viridis.*

PLATE VIII.

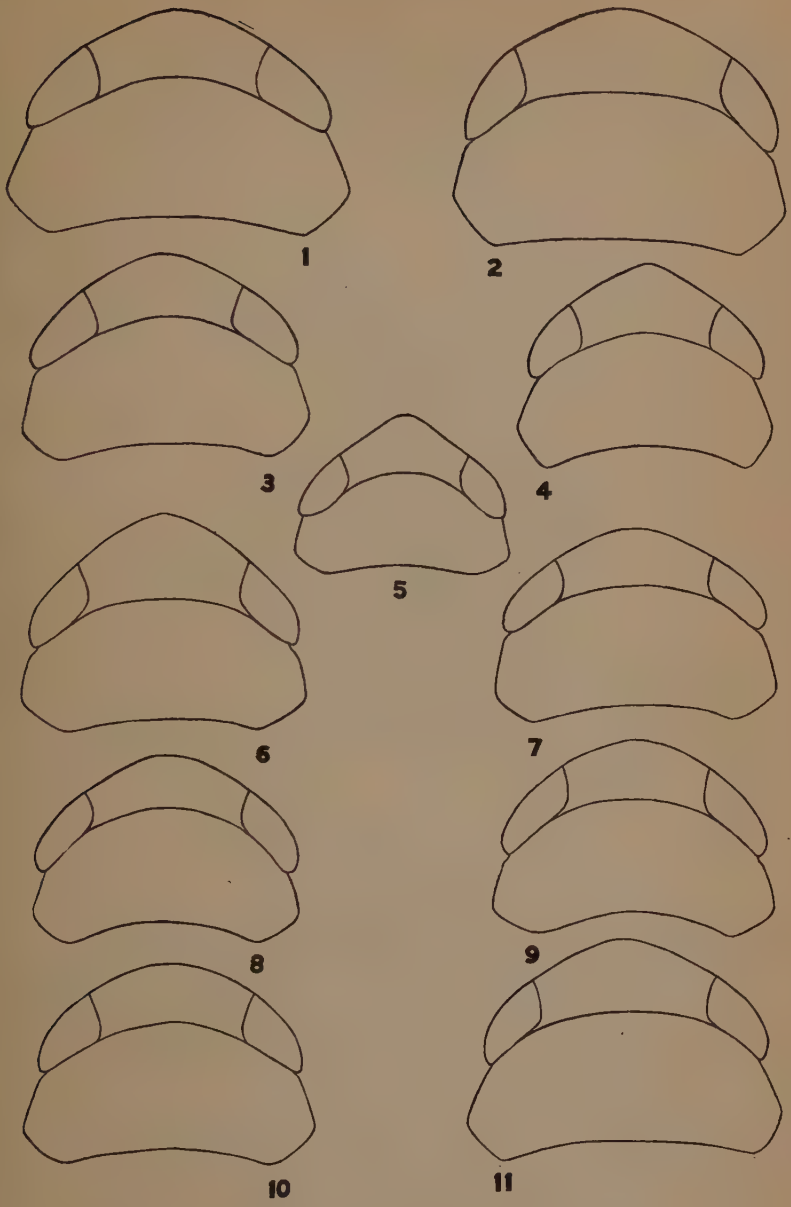

PLATE IX.

FIG. 1. *A. acuminatus.*
FIG. 2. *A. productus.*
FIG. 3. *A. angulatus.*
FIG. 4. *A. pallidus.*
FIG. 5. *A. brunneus.*
FIG. 6. *A. viridis.*
FIG. 7. *A. viridis var. variegatus.*
FIGS. 8 and 9. *A. inornatus.*

PLATE IX.

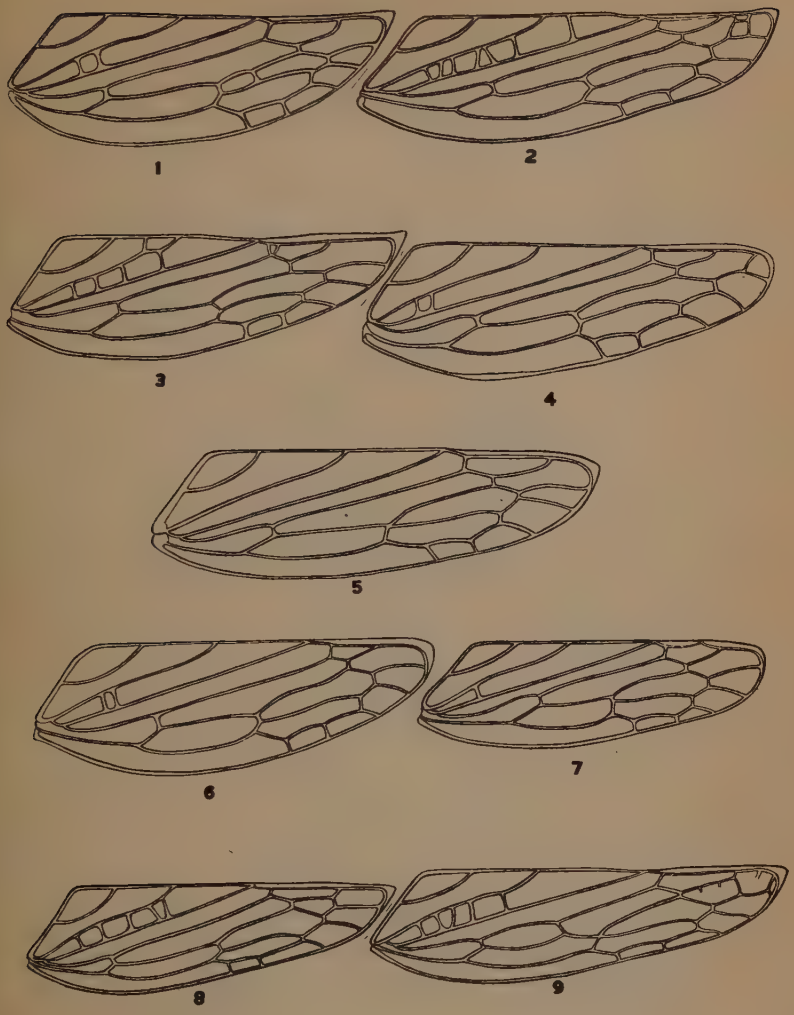

PLATE X.

FIG. 1. *A. acuminatus.*
FIG. 2. *A. angulatus.*
FIG. 3. *A. productus.*
FIG. 4. *A. viridis.*
FIG. 5. *A. ~~viridis~~.* obtutus
FIG. 6. *A. inornatus.*
FIG. 7. *A. brunneus.*

PLATE X.

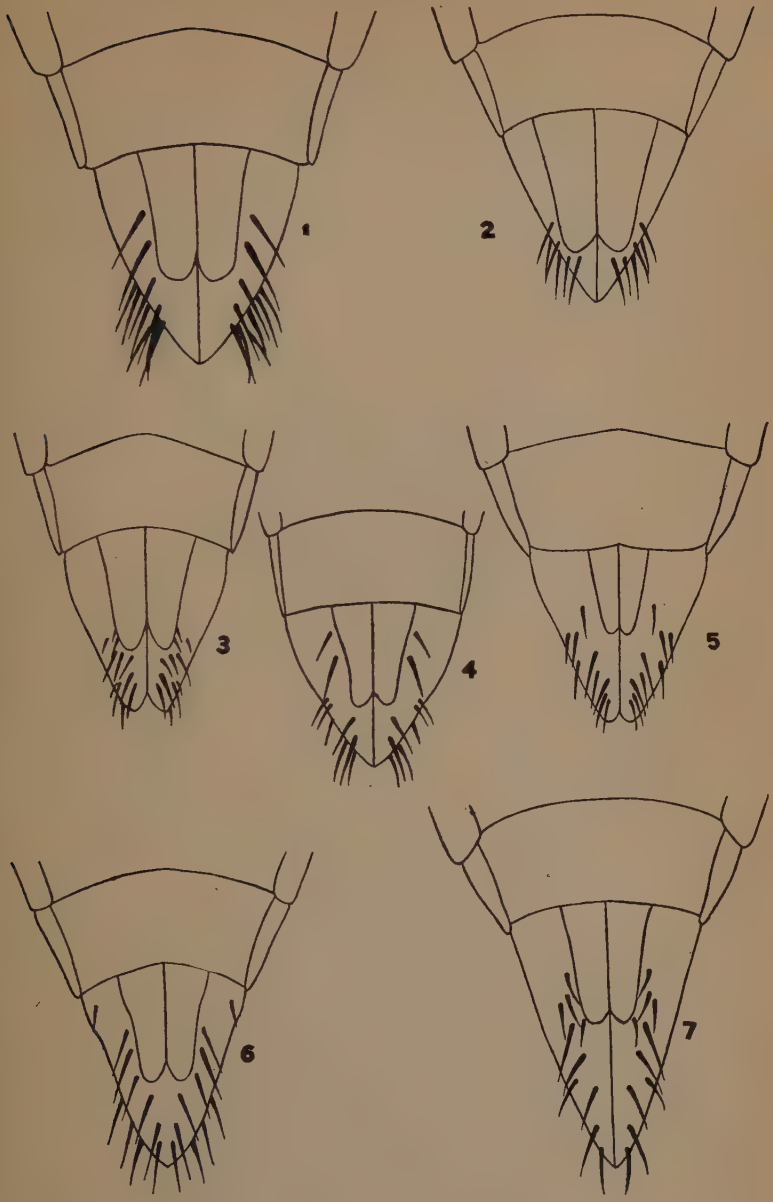

PLATE XI.

Fig. 1. *A. acuminatus.*
Fig. 2. *A. pallidus.*
Fig. 3. *A. productus.*
Fig. 4. *A. angulatus.*
Fig. 5. *A. viridis.*
Fig. 6. *A. brunneus.*
Fig. 7. *A. inornatus.*

PLATE XI.

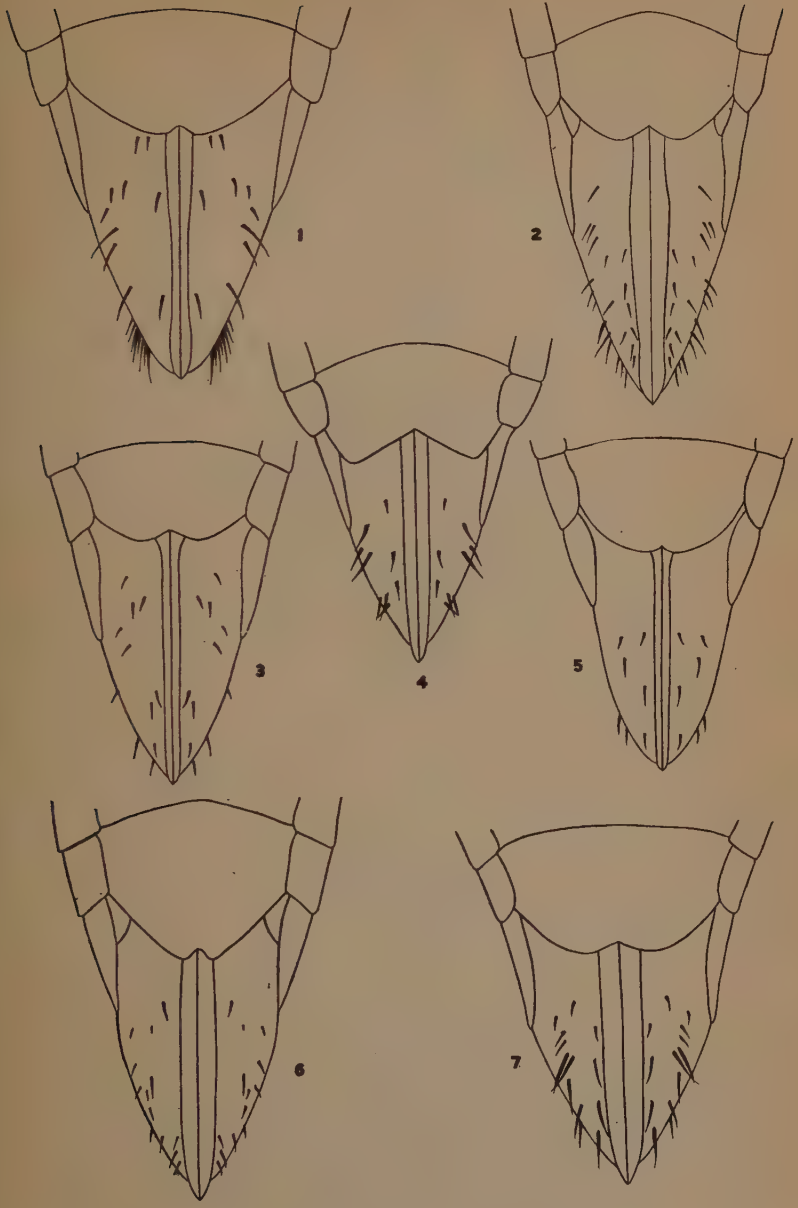

PLATE XII.

FIGS. 1 AND 2. *A. acuminatus.*
FIGS. 3 AND 4. *A. obtutus.*
FIGS. 5 AND 6. *A. angulatus.*
FIGS. 7 AND 8. *A. viridis.*
FIGS. 9 AND 10. *A. brunneus.*
FIGS. 11 AND 12. *A. inornatus.*
FIGS. 13 AND 14. *A. productus.*
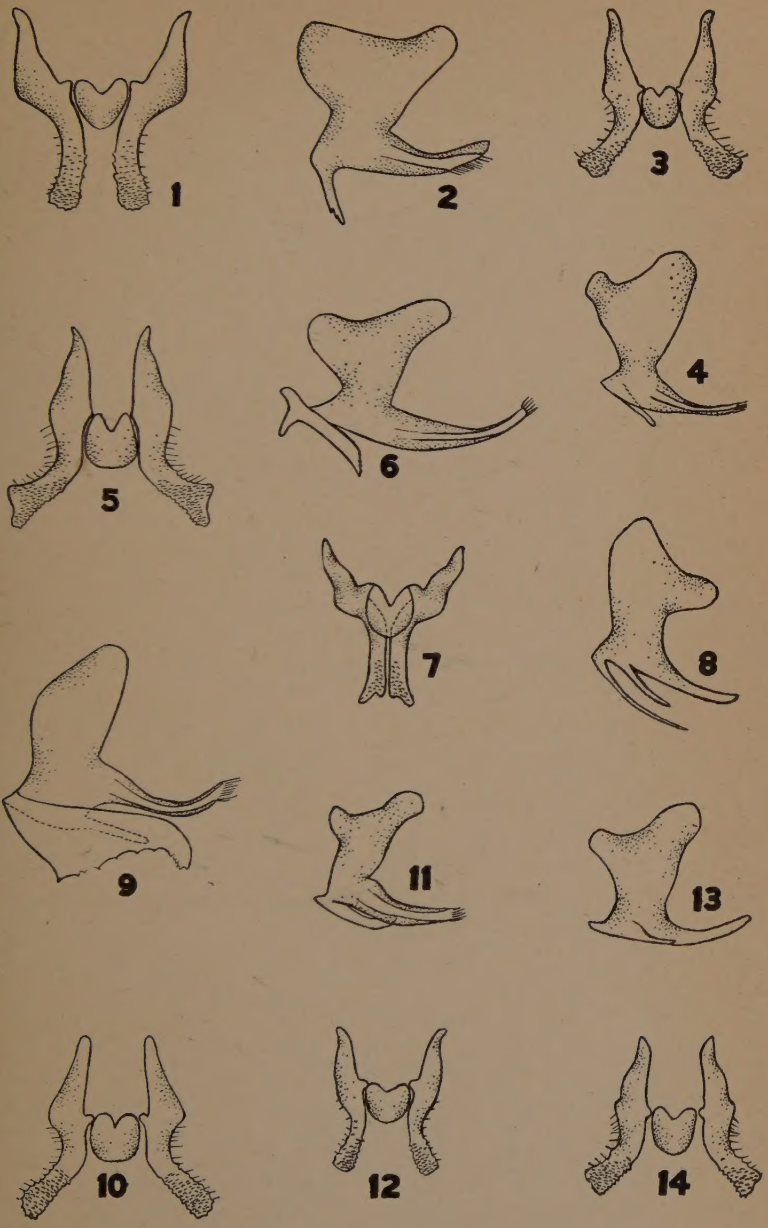
PLATE XII.